New Test Quantifies Aflatoxin in Grain

There's no place to hide for a crop-damaging fungus that attacks corn, thanks to a new laboratory test that unmasks the extent of the fungus' forays in the corn seed.

The target is *Aspergillus flavus,* the culprit behind a highly toxic grain contaminant called aflatoxin. Federal law prohibits the sale of grain for human consumption if it contains more than 20 parts per billion of aflatoxin, or 200 parts per billion in feed for nonlactating animals.

The new test developed by ARS microbiologist Thomas E. Cleveland and plant pathologist Robert L. Brown can demonstrate the fungus' ability to grow in various corn kernels—valuable information for commercial plant breeders. The test has generated interest at Mississippi State, Mississippi, where ARS geneticist Paul Williams and plant pathologist Gary L. Windham are concentrating on breeding corn lines that fend off *A. flavus*.

"Scientists have suspected for a long time that some corn varieties carry natural resistance, but until now we haven't been able to select for them carefully," says Cleveland, who is based at ARS' Southern Regional Research Center in New Orleans.

Previous tests verified *A. flavus'* presence in corn, but they took days to complete and didn't necessarily indicate the amounts of the fungus present. With the new test, *A. flavus* activity in corn kernels inoculated with the fungus can be quantitatively detected in a single day.

A. flavus is naturally present in all soils, but problems occur when its metabolic byproduct, aflatoxin, accumulates in the tissues of crops such as corn or peanuts. It can also contaminate cottonseed, an important ingredient in feed for beef and dairy cattle. Fungicides offer some protection but must be used in such large quantities that they're not economical.

To track the fungus, researchers attach foreign genetic material called a reporter, or marker, gene to a portion of an *A. flavus* gene involved in cell division and growth. ARS scientists are working closely with university cooperators—among them, Gary Payne at North Carolina State University—in the construction of reporter gene-containing strains of the fungus. *A. flavus* strains are then used to inoculate corn breeding lines.

To check the growth of the fungus in a particular corn kernel, the kernel is sliced open and soaked in a special chemical solution that reacts with a measurable enzyme produced by the inserted reporter gene. Activity is indicated by a blue stain.

"If plant breeders are going to develop new corn hybrids with resistance to the fungus, it's very important to be able to measure the amount of the fungus' growth in the seed," Brown concludes.—By **Jill Lee**, ARS.

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